

The man who asks a question is a fool for a minute, the man who does not ask is a fool for life:---Confucius

Department of Mathematics
St. Paul's Cathedral Mission College, Kolkata
Affiliated by University of Calcutta)

Name of the Programme: B.Sc. Mathematics(Honours/general) (Under CBCS)

Year of Introduction: 2018

Programme Specific Outcome (PSO) & Course Outcome (CO)

Program specific Outcome:

PSO1: The basic objective of Studying Mathematics Honours/ general course is to develop the mathematical reasoning power of the students and logical support behind an assumption. Throughout the entire course the students learn different branches of mathematics with which they are not only equipped with solution of different types of problems by framing a proper mathematical model but they can logically justify the model and the computational procedures with proper mathematical reasoning.

PSO2: Another objective of teaching Mathematics Honours/general course is to enhance the power of critical thinking of the students by solving varieties of unsolved Mathematical problems and this programme will provide a very strong foundation in Mathematics.

PSO3: The entire syllabus for Undergraduate Course is framed in such a way that the students can solve the mathematical problems with minimum error and the students will be equipped with mathematical skills and techniques which can be applied in both academic and non-academic areas in work.

PSO4: The entire syllabus is framed in such a fashion so that the students will develop strong understanding and good grasp of the areas like Algebra, Analysis, Geometry, Calculus, Mechanics, Mathematical methods and OR. The theory and its applications will motivate the students for critical thinking towards further specialisation and research.

PSO5: The course is designed in such a fashion that students will develop a comprehensive knowledge of all the classical and applied fields of mathematics so that they can pursue higher education in India and abroad. The course also helps to equip themselves for the employment sectors such as different consultancy services, teaching in educational institutes, other government and service sectors.

Name of the Programme: B.Sc. Mathematics (HONOURS) (Under CBCS) Year
of Introduction: 2018

Course Outcome (CO):

Course outcome of Semester I(Content provides Calculus, Geometry, Vector and Algebra)

CO 1. The students will familiar with the basic knowledge calculus, Geometry and Vector algebra. In course of study they will learn different applications of calculus broad ideas of two and three dimensional geometry and application of vector geometry which will help them to develop a good grasp over the subject. Tutorial classes will help the students to improve the basic conception of the said subjects by working out problems. Internal assessments will help the students to know their progress.

CO 2. This content provides the knowledge of complex number, theory of equations, inequalities, number theory, determinants and matrices and their applications, idea of set, mapping and relation, which will develop a foundation of classical algebra. In tutorial classes students will get to know about the application of mathematics in different field like generation of ISBN, ISSN, Credit Card Number, inequalities to solve many real life problems and finally a broader reading will help the students to improve the basic conception of classical algebra. Internal assessments will help the students to know their progress.

Course outcome of Semester II(Content provides Real Analysis, Group Theory-I)

CO 3. The contents provide the detail understanding in real numbers, sequences, sub sequences and the idea of convergence of infinite series Corresponding tutorials help the students to acquire the knowledge of Graphical representation on functions and to improve the basic conception of the said subject by working out problems. Internal assessments will help the students to know their progress.

CO 4. The contents provide ideas of algebraic structure starting from groupoid to group, cyclic groups, normal subgroups, quotient groups, isomorphism theorems etc. Tutorial classes will help the students to learn the practical application of group theory including study of different symmetric groups which are immensely used in different branches of Physics and Chemistry. Finally working out of problems in tutorial classes will help the students to get a broader view of the subject. Internal assessments will help the students to know their progress.

Course outcome of Semester III(Content provides Theory of Real Function, ODE & Multivariate Calculus I, Ring Theory and Linear Algebra)

CO 5. The content includes the concept of limit, continuity, differentiability, mean value theorems etc in details and it will help the students to upgrade their knowledge of Real analysis. Through the tutorial classes students will improve the conception of the subject by working out problems. Internal assessments will help the students to know their progress

CO 6. This course introduces structures of Rings and Fields including ideas of homeomorphisms of ring and also basic idea of vector spaces, linear transformations, eigen values and eigen vectors. Through the tutorial classes students will learn the applications in real life problems and improve the conception of the subject by working out problems. Internal assessments will help the students to know their progress

CO 7. The course introduces the knowledge of ordinary differential equations up to second order and basic ideas of multivariate calculus which are essential for the students for the application of mathematics in different branches. Through the tutorial classes students will learn the applications in real life problems and improve the conception of the subject by working out problems. Internal assessments will help the students to know their progress

Course outcome of Semester IV(Contents are Riemann Integration, PDE & Multivariate Calculus-II, Mechanics)

CO 8. The course includes knowledge of Riemann Integration, Improper integrals, theory of sequence and series of functions which are essential for a qualitative foundation of Pure Mathematics. The theory of Riemann integrals introduces an arithmetical and analytical approach towards study of integration. Through the tutorial classes students will learn the applications of the subjects taught and improve the idea by working out problems. Internal assessments will help the students to know their progress

CO 9. The course includes knowledge of Partial Differential Equations and detailed knowledge of multivariate calculus including vector calculus, which is needed in the study of higher Mathematics. Through the tutorial classes students will learn the applications of the subject by solving different problems of physics and improve the conception of the subject by working out problems. Internal assessments will help the students to know their progress

CO 10. The course includes knowledge of both dynamics and statics, in which the students study single particle and many particle systems, motion in straight line and plane, coplanar forces, virtual work and stability. Basically dynamics is the translation of a real life problem into differential equation and rest is the solution of differential equation with proper boundary conditions. Through the tutorial classes students will learn the applications of the subject by solving different problems of physics and improve the conception of the subject by working out problems. Internal assessments will help the students to know their progress.

Course outcome of Semester V(Contents are Probability & statistics, Group Theory-II, Linear Algebra-II)

CO 11. The course includes of mathematical theory of Probability in an axiomatic manner using Borel field, concept of random variable, study of discrete and random distributions, study of expectation, convergence in probability, idea of sample and population, different sampling distributions, estimation of parameters and hypothesis testing. During the course of study the students get a detailed idea of random variables and its distributions which are applied in different real life problems. Through the tutorial classes students will learn the applications of the subject in combinatorial problems, encounter problems, problems of stochastic process and improve the idea by working out problems. Internal assessments will help the students to know their progress.

CO 12. The course includes extended knowledge of group theory including Automorphism, automorphism groups, direct product of groups and extended knowledge of linear algebra including inner product spaces, norms, Gram-Schmidt orthonormalisation, Bilinear and quadratic forms, Diagonalisation of symmetric matrices, Hessian matrix, Cayley-Hamilton theorem, the minimal polynomial for a linear operator, canonical forms (Jordan & rational) etc. Through the tutorial classes students will learn the applications of the subject in geometry representing phenomenon such as symmetry and certain type of transformation. Internal assessments will help the students to know their progress.

Course Outcome of Semester VI(content provides Metric Space & Complex Analysis, Numerical Methods)

CO 13. The course includes basic concept of Metric Spaces and idea of Complex Analysis which are essential for a qualitative foundation of Pure Mathematics. Metric is the generalization of the concept of distance. During the study of Metric Spaces the students are taught the treatment of convergent sequences continuous functions, compactness, connectedness, contraction mapping and Banach fixed point theorem. In complex analysis the course aims to give basic foundation by introducing stereographic projection, point at infinity, analyticity, Cauchy-Riemann equations, Mobius transformation, power series, contours and integration along a contour. Through the tutorial classes of metric space students will learn the applications

of the subject in differential equation, image classifications and may other branches of functional analysis. In tutorial class of complex analysis the students get a vast exposure by working out problems of fluid mechanics, plasma dynamics and others. Internal assessments will help the students to know their progress.

CO 14. The course includes approximation of numbers, interpolation, numerical differentiation and integration, solution of transcendental and polynomial equations matrix inversion and solution of differential equations. With this basic knowledge of Numerical methods solution of complex heat transfer problems involving mechanisms such as conduction, convection, radiation can be done. In practical classes the students work out several problems of the above noted topics using computer programming which improve their skill for managing a real life problem.

Skill enhancement course and Discipline specific elective course:

CO 1. Skill Enhancement Courses and Discipline Specific Elective papers open up new avenues and job opportunities for the students.

CO 2. Students have to select one Skill Enhancement Course (SEC) from C – programming Language and object oriented programming in C ++ in Semester III and one from Mathematical Logic, Scientific computing with Sage Math & R in Semester-IV . These topics enhance Computer skills of the students which help them to work in industrial sector.

CO 3. Students have to select two Discipline Specific Elective (DSE A and B) courses in fifth and sixth semesters. For Semester V students have to take one from Advanced Algebra, Bio Mathematics , industrial Mathematics as DSE-A and from Discrete mathematics, Linear Programming , Boolean Algebra& Automata as DSE- B. For 6th Semester students have to take one from Differential Geometry, Mathematical Modelling, Fluid Statics and elementary Fluid Dynamics as DSE -A also take one from Point set Topology , Astronomy& space Science, Advanced Mechanics as DSE- B. These special courses help to open up new avenues for the students for their future research and knowledge development.

CO 4. These special courses enhance skills, enhance knowledge and develop entrepreneurship qualities which help in progression to higher studies, research and job opportunities .

Name of the Programme: B.Sc. Mathematics (General Course) (Under CBCS)

Year of Introduction: 2018

Course Outcome of Semester I:(Content provides Algebra, Differential calculus, Differential equations , Geometry)

CO1 This content provides (i) the knowledge of Algebra comprising complex number, polynomials, theory of equations, matrices & their application for solution of equations, (ii) Differential calculus comprising real line topology, limit, continuity, derivative and functions of two and three variables (iii) Differential equations up to second order and (iv) Co-ordinate geometry of two and three dimensions. After reading these contents the students develop a moderate base over Algebra, Differential Calculus, geometry and differential equations. Tutorial classes will help the students to improve the basic skill of the said subjects by working out different problems of mathematics applied in different problems. Internal assessments will help the students to know their progress.

Course Outcome of Semester II:(Content provides Differential calculus-II, Differential equations-II , Vector Algebra, Discrete Mathematics)

CO2 The contents provide advance knowledge of (i) Differential calculus comprising sequence and series of numbers, mean value theorems, problems of maxima and minima and indeterminate forms (ii) Differential equations comprising Linear homogeneous and non homogeneous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations etc.(iii) Vector algebra comprising Scalar and Vector products of two and three vectors, Simple applications to problems of Geometry, Vector equation of plane and straight line, Volume of Tetrahedron and (iv) Discrete mathematics comprising Integers, Congruences, Application of congruences and Boolean Algebra. Tutorial classes will help the students to improve the basic skill of the said subjects by working out different problems of mathematics applied in different problems. Particularly generation of UPC, ISBN, ISSN, Credit Card Number are done with the help of congruences. Internal assessments will help the students to know their progress.

Course Outcome of Semester III:(Content provides Integral Calculus, Numerical Methods, Linear Programming Problem)

CO 3: The content provides ideas of Integral Calculus including improper integrals and Beta Gamma functions, Numerical methods comprising approximation of numbers, interpolation, numerical differentiation and integration, solution of transcendental and polynomial equations and LPP comprising Simplex method, Graphical solution, Duality, Transportation and assignment problems. Tutorial classes will help the students to improve the basic skill of the said subjects by working out different problems of mathematics .Particularly numerical methods provide approximate solution to some problems which cannot be solved analytically and LPP is now used in management problems, industry related problems and many others. Internal assessments will help the students to know their progress.

Course Outcome of Semester IV:(Content provides Algebra, Computer Science & programming, probability and Statistics. Numerical Methods, Linear Programming Problem)

CO 4 : The content provides (i) elementary idea of Algebraic structure of groups, rings , fields and also basic idea of vector spaces (ii) basic idea of computer science and programming with a flavour of C and C++ language (iii) Idea of Probability and statistics including the idea of random variable, its distributions, different statistical diagrams, sampling theory and hypothesis testing. Tutorial classes will help the students to improve the basic skill of the said subjects by working out different problems of mathematics applied in different problems. Internal assessments will help the students to know their progress.

Course Outcome of Semester V:(Content provides Particle dynamics,/ Graph theory)

CO5: This DSE course Particle Dynamics/ Graph Theory gives an exposure to make the students prepared for excelling them to higher education. Both o the topics have many applications in real life. Tutorial classes will help the students to improve the basic skill of the said subjects by working out different problems of mathematics applied in different problems. Internal assessments will help the students to know their progress.

Course Outcome of Semester VI:(Content provides Adv Calculus/ Mathematical Finance)

CO6: The DSE course Advanced calculus gives an opportunity to study power series, uniform convergence, Fourier series and Laplace Transforms which is frequently used to solve many problems of mathematics. The DSE course Mathematical Finance gives an opportunity to study Interest (simple and compound, discrete and continuous),time value of money, inflation, net present value, internal rate of return power, Comparison of NPV and IRR. Bonds, bond prices and yields. Floating-rate bonds, immunization. Asset return, short selling, portfolio return, which are the need of present day job.